What is claimed is:

1. A method for maintaining a ratio of gas volume to liquid volume in a segmented gas/liquid flow along a reactor containing monolithic catalyst beds in series, the method comprising:

initiating the segmented gas/liquid flow at a first end of the reactor by introducing feed liquid and feed gas both at a predetermined volume and a predetermined flow rate;

propagating the segmented flow through the monolithic catalyst beds

injecting additional amounts of gas at least once into the spaces between the monolithic catalyst beds;

collecting the segmented gas/liquid flow at a second end of the reactor.

2. The method of claim 1, wherein the number of the monolithic catalyst beds in series is at least two.

3. The method of claim 2, wherein the monolithic catalyst beds in series are joined together by a connector for injecting gas.

4. The method of claim 3, wherein the segmented gas/liquid flow is co-current flow in a downwardly or upwardly direction through the catalyst bed.

5. The method of claim 4, wherein the segmented gas/liquid flow is maintained near or within the Taylor flow regime.

6. The method of claim 5, wherein the internal diameter of the channels of the monolith catalytic elements in the monolithic catalyst beds is in a range from about 0.5 millimeters to about 6 millimeters.

7. The method of claim 5, wherein the gas is selected from the group consisting of: hydrogen, oxygen, carbon monoxide, chlorine, fluorine, nitric oxide, nitrogen dioxide, nitrous oxide, nitric acid, ammonia, sulfur dioxide, sulfur trioxide, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, hydrogen fluoride, and mixtures thereof.

8. The method of claim 5, wherein the gas is a mixture of reactive gases and inert gases, the reactive gases being selected from the group consisting of hydrogen, oxygen, carbon monoxide and mixtures thereof and the inert gases being selected from the group consisting of helium, nitrogen, argon, carbon dioxide, methane, ethane, propane, and mixtures thereof.

9. The method of claim 5, wherein the monolithic catalyst bed is selected to carry out reactions selected from the group consisting of hydrogenation, oxidation, carbonylation, nitration, amination, sulfonation, chlorination, sulfidation, cyanation, or fluorination.

10. The method of claim 5, wherein the ratio of gas volume to liquid volume has a value in the range of 0.1-10 at the pressure in the reactor.

11. The method of claim 1, further comprising the steps of:

separating the gas and the product containing liquid;

recycling the gas and the product containing liquid through the reactor; and

recovering product from the product containing liquid.

12. A method for maintaining the ratio of gas volume to reactant liquid volume in a gas/liquid segmented flow in order to maintain the segmented flow near or at the Taylor flow regime along a reactor containing a plurality of monolithic catalyst beds, the beds having axially aligned channels and in which at least two beds define an intrabed space, the method comprising:

initiating a segmented gas/liquid flow at the start of a first monolithic catalyst bed by introducing a reactant liquid and gas into the axially aligned channels;

propagating the segmented flow by introducing more of each of the reactant liquid and the gas at the start of a first monolithic catalyst bed as the segmented gas/liquid flow passes through the catalyst beds;

injecting an additional amount of gas into the reactor into the intrabed space; and

collecting the gas and product containing liquid at the bottom of the last of the catalyst beds.

13. The method of claim 12, wherein the gas is selected from the group consisting of hydrogen, oxygen, carbon monoxide, chlorine, fluorine, nitric oxide, nitrogen dioxide, nitrous oxide, nitric acid, ammonia, sulfur dioxide, sulfur trioxide, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, hydrogen fluoride, and mixtures thereof.

14. The method of claim 12, wherein the gas is a mixture of reactive gases and inert gases, the reactive gases being selected from the group consisting of hydrogen, oxygen, carbon monoxide, and mixtures thereof and the inert gases being selected from the group consisting of helium, nitrogen, argon, carbon dioxide, methane, ethane, propane, and mixtures thereof.

15. The method of claim 12, wherein the segmented flow is co-current flow in a downwardly or upwardly direction through the reactor.

16. The method of claim 12, wherein the internal diameter of the channels of the monolith catalytic elements is in a range from about 0.5 millimeters to about 6 millimeters.

17. The method of claim 12, wherein the gas to liquid volumetric ratio is in the range of 0.1-10 at the pressure within the reactor.

18. The method of claim 12, further comprising the steps of:

separating the gas and the product containing liquid;

recycling the gas and the product containing liquid through the reactor; and

recovering product from the product containing liquid.

19. The method of claim 12, wherein the monolithic catalyst bed is selected to effect reactions selected from the group consisting of hydrogenation, oxidation, and carbonlyation.

20. A method for maintaining a ratio of gas volume to liquid volume in a segmented gas/liquid flow along a reactor containing at least a first monolithic catalyst bed and a second monolithic catalyst bed, the monolithic catalyst beds being in series and being separated by an intra-bed space, the method comprising:

initiating segmented gas/liquid flow within the first monolithic catalyst bed by introducing feed liquid and feed gas both at a predetermined volume and a predetermined flow rate;

propagating the segmented flow through the first monolithic catalyst bed;

injecting an additional amount of gas into the reactor into the intrabed space between the first monolithic catalyst bed and the second monolithic catalyst bed;

initiating segmented gas/liquid flow within the second monolithic catalyst bed by introducing feed liquid and feed gas both at a predetermined volume and a predetermined flow rate;

propagating the segmented flow through the second monolithic catalyst bed; and

collecting the segmented gas/liquid flow from the reactor.

21. A method for maintaining a ratio of gas volume to liquid volume in a segmented gas/liquid flow along a reactor containing at least a first monolithic catalyst bed and a second monolithic catalyst bed, the monolithic catalyst beds being in series and being separated by an intra-bed space, the method comprising:

initiating segmented gas/liquid flow within the first monolithic catalyst bed by introducing feed liquid and feed gas both at a predetermined volume and a predetermined flow rate;

propagating the segmented flow through the first monolithic catalyst bed;

injecting an additional amount of gas into the reactor into the intrabed space using an injecting connector that is sealably connected to the first monolithic catalyst bed and the second monolithic catalyst bed;

initiating segmented gas/liquid flow within the second monolithic catalyst bed by introducing feed liquid and feed gas both at a predetermined volume and a predetermined flow rate;

propagating the segmented flow through the second monolithic catalyst bed; and

collecting the segmented gas/liquid flow from the reactor.

22. A reactor using a monolithic catalyst, the reactor comprising:

at least two monolithic catalyst beds arranged in series, wherein each catalyst bed has an inlet end and a outlet end and channels substantially parallel to the direction of flow from the inlet end to the outlet end;

a controllable gas injector in fluid communication with the inlet end of the first catalyst bed;

a controllable liquid injector in fluid communication with the inlet end of the first catalyst bed;

a connector for controllably injecting hydrogen, wherein the connector is sealably secured between the

outlet end of the first catalyst bed and the inlet end of a subsequent bed; and

a collecting and separating apparatus for the gas and the reactant liquid at the bottom of the last of the catalyst beds.

23. The apparatus of claim 22, wherein the gas is selected from the group consisting of hydrogen, oxygen, carbon monoxide, chlorine, fluorine, nitric oxide, nitrogen dioxide, nitrous oxide, nitric acid, ammonia, sulfur dioxide, sulfur trioxide, hydrogen chloride, hydrogen cyanide, hydrogen sulfide, hydrogen fluoride, and mixtures thereof.

24. The apparatus of claim 22, wherein the gas is a mixture of a reactive gas chosen from the group consisting of hydrogen, oxygen, carbon monoxide, and mixtures thereof and an inert gas chosen from the group consisting of helium, nitrogen, argon, carbon dioxide, methane, ethane, propane, and mixtures thereof.

25. The apparatus of claim 22, wherein the segmented flow is co-current flow in a downwardly or upwardly direction through the reactor.

26. The apparatus of claim 22, wherein each of the catalyst beds have more than one axially parallel channels, the internal diameter of the channels of the monolith catalytic elements is in a range from about 0.5 millimeters to about 6 millimeters.

27. The apparatus of claim 22, wherein the gas to liquid volumetric ratio is in the range of 0.1-10.

28. The method of claim 22, wherein the monolithic catalyst bed is selected to effect a reaction selected from the group consisting of hydrogenation, oxidation, and carbonylation.